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**ODESSA NATIONAL ACADEMY OF
FOOD TECHNOLOGIES**

International Competition of
Student Scientific Works

BLACK SEA SCIENCE 2018

PROCEEDINGS



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Odessa National Academy of Food Technologies

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**ASSESSMENT OF THE OPTIMAL CAPITAL STRUCTURE
OF UKRAINIAN AGRICULTURAL HOLDINGS
(KERNEL HOLDING S.A., MHP S.A.)**

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The optimal capital structure is a structure in which an optimal ratio between the level of return on equity and the level of financial sustainability is ensured, and, thus, the value of an enterprise (or its shares) is maximized.

An unstable economic situation brings forward the optimal capital structure problem. It is of current interest nowadays as the optimal capital structure allows rational use of financial resources and affects the value of an enterprise.

The purpose of the article is to study the capital structure at different levels of debt load and identify the optimal. The objects of study are Ukrainian agricultural holdings Kernel Holding S.A. and MHP S.A.

Basic financial indicators of enterprises economic activity for a period of 5 years have been analyzed in this work. They are: revenues from sales, EBITDA and operating profit, economic profitability and return on assets.

Moreover, WACC model has been used in the study that allowed calculating the value of capital at different levels of debt load and finding the optimal ratio of equity and debt capital.

The result of this article is the conclusion that the capital structure of both MHP S.A. and Kernel is not optimal, but tends to it. The solution to this problem may be an increase in the share of debt capital, since its cost is cheaper. However, due to increased liabilities, the risk of insolvency increases, and this in turn can lead to bankruptcy of companies. Consequently, the decisions of the company's managers must be verified and weighed.

Introduction

Shortage of financial and investment resources for development and tight credit policy of National Bank of Ukraine are the reasons why companies with access to credit resources abroad have a competitive advantage. Disproportion between the cost of capital in Ukraine and EU markets is due to the high risks of entrepreneurial activity in Ukraine.

The main risks that are inherent in the current state of development are the following: the difficult economic and political situation, the default risk, the risk of hryvnia devaluation, high inflation and the risk of losing the country investment attractiveness for foreign investors.

Ukrainian agricultural holdings play an increasingly important role in the development of the Ukrainian economy [1]. The most powerful of them have a high credit rating and use the funds raised on the European stock markets for the development of production in Ukraine. This is why these days the problem of studying the Ukrainian agricultural holdings capital structure is especially topical, since the optimal capital structure allows rational use of financial resources and positively affects the company's value.

Problems of the capital structure formation were investigated in the works of Modigliani and Miller [2], J. Williams [3]. Formation of the capital structure in current economic conditions is considered in the works of M.A. Zubkov, D. A. Vorontsov [4], V. V. Ivashkovskaya, Kupriyanov S. V. [5], M. M. Kalimulin [6], T. V. Teplova [7] and other scientists. However, assessment of the Ukrainian agricultural holdings optimal capital structure as an important element of the national economy is out of economists' sight and requires more detailed research.

The main purpose of this work is to determine the optimal capital structure of Ukrainian agricultural holdings in current economic conditions using the weighted average capital cost method on the example of Kernel Holding S.A. and MHP S.A.

Concept of the optimal capital structure and methods of its calculation

The efficiency of a modern enterprise to a large extent depends on the strategy of the capital structure managing, that is to find the optimal ratio of equity and debt capital according to various criteria. In a broader sense, the capital structure optimization is the process of finding the optimal choice between the level of risk and the level of return on capital.

From this point of view the purpose of the capital structure management is to minimize the company's expenses in case of the long-term financing attraction and to ensure the greatest effect from investing funds, i.e. its optimization at a particular enterprise.

There are three approaches to optimization of the enterprise's capital structure in economic theory:

1) optimization of the capital structure based on the criterion of maximization of the financial profitability level which implies the use of the financial leverage mechanism;

2) optimization of the capital structure based on the criterion of its value minimization which implies the preliminary estimation of the equity capital and raised funds costs, as well as the calculation of the weighted average capital cost;

3) optimization of the capital structure based on the criterion of the financial risks level minimization.

Such criteria for optimization of the capital structure of an enterprise allow us to compare and justify their applications depending on the objectives of capital formation, i.e. at different stages of the enterprise's life cycle.

It should be noted that the main goal that an enterprise should set itself while determining the ways of managing capital is to ensure the well-being of the enterprise's owners, i.e. to achieve a certain level of profitability or to increase the capital market value.

So, the optimal capital structure is a structure that provides the best ratio between the level of return on equity and the level of financial sustainability, and, thus, the value of an enterprise (or its shares) is maximized.

There are the following basic methods for determining the optimal capital structure: the operating profit method, EBIT-EPS methods, the weighted average capital cost (WACC) method. The latter methods allow us to determine the optimal capital structure with high accuracy. However, when making financing decisions, the management most often is guided not only by efficiency issues, but also by the visibility of options. In this regard, in this work the weighted average capital cost (WACC) method is used.

The WACC method is a method where the optimal capital structure is achieved at the point where the company value is maximized and the weighted average capital costs are minimal. To determine WACC a hybrid calculation formula which includes the greatest number of factors was used in this article:

$$WACC = r_d * w_d * (1 - T) + r_e * w_e, \quad (1)$$

where: r_d – cost of debt capital;

w_d – share of debt capital;

T – tax rate on profit (18%);

r_e – cost of equity capital;

w_e – share of equity capital.

To calculate the cost of debt capital, the following formula was used:

$$r_d = r_{f(us)} + sovereign_{spread} + default_{spread}, \quad (2)$$

where: $r_{f(us)}$ – risk-free rate of return on seven-year US government bonds [8];

$sovereign_{spread}$ – sovereign spread of Ukraine [9];

$default_{spread}$ – spread of the company's default, which is determined based on its credit rating [10].

The hybrid formula CAPM was used to calculate the value of equity capital:

$$r_e = r_{f(us)} + \beta_{ul} * (1 + \frac{D * (1 - T)}{E} * MRP_{(us)} + sovereign_{spread}), \quad (3)$$

where: β_{ul} – coefficient of sensitivity to risks, purified from the influence of debt load, for the same area as the investigated one [11];

$MRP_{(us)}$ – market bonus for the developed US market [12].

Determination of the optimal structure of the MHP S.A. company

MHP S.A. is one of the largest agroindustrial complexes of Ukraine for poultry breeding. The company has several lines of activity: poultry farming and related productions (chilled chicken and fast food products), production of meat products (fresh premium beef, foie gras, sausages and smoked products), crop production (growing of maize, wheat, sunflower, rape), production of feed, sunflower oil etc.

MHP S.A. consists of 20 enterprises located in Kiev, Cherkassy, Dnepropetrovsk, Donetsk, Vinnitsa, Ivano-Frankivsk and Kherson regions. All enterprises create a closed cycle of meat production: growing of cereals, mixed fodders production, nurturing the parental livestock, meat production and meat processing. The total number of employees is more than 12 000 people.

The company produces products under the trademarks "Nasha Ryaba" and "Nasha Ryaba Appetitnaya" (chilled chicken meat), "Fua Gra" (delicacy goose liver), "Sertifitsirovannyiy Angus" (delicacy beef of Aberdeen Angus), "Legko" (natural meat ready-to-cook products). It has its developed distribution network which includes 7 branches in its structure.

MHP S.A. exports its products to different countries of the world. In particular, in 17 EU countries: the Netherlands, Ireland, Belgium, Poland, Italy, Greece etc.; the CIS countries and the Customs Union: Armenia, Kyrgyzstan, Kazakhstan, Georgia, Moldova, Uzbekistan, Tajikistan; countries of the Middle East: Iraq, Jordan, Lebanon, United Arab Emirates, Kuwait; and also to the countries of Africa: Egypt, Libya, the Democratic Republic of Congo and other world countries.

MHP S.A. is the leading company of the Ukrainian chicken meat market. It occupies about 35% of the chicken meat market and more than 55% of the Ukrainian market of chicken meat industrial production. This is the first Ukrainian agroindustrial company, whose securities are quoted on the main site of London Stock Exchange.

MHP S.A. key performance indicators for a period of 5 years are presented in Table 1.

Table 1 – MHP S.A. key performance indicators [13]

Year	Revenue from sales, TUSD	EBITDA, TUSD	Operating profit, TUSD	Net profit / loss, TUSD	ROE, %	ROA, %
2011	1 229 090	401 085	320 744	259 355	28.01	20.63
2012	1 407 522	467 718	380 583	310 916	25.94	18.80
2013	1 496 079	391 070	271 836	162 240	12.99	14.13
2014	1 379 048	555 876	414 975	-412 338	-43.61	24.24
2015	1 183 283	459 041	363 915	-125 726	-18.69	22.11

Information on the indicators "EBITDA" and "Net profit / loss" is clearly shown in figures.

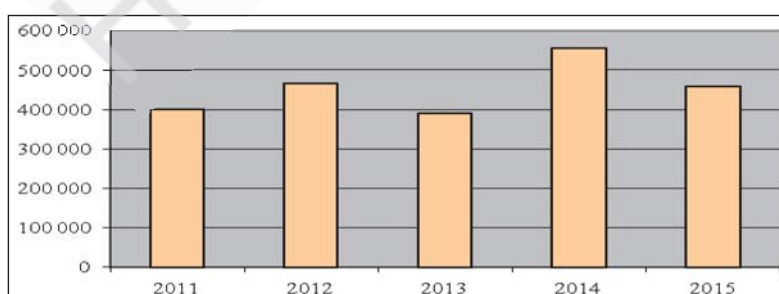


Fig. 1. Dynamics of changes in "EBITDA" of MHP S.A., TUSD

The highest value "EBITDA" indicator has in 2014 (555 876 TUSD), the lowest – in 2013 (391 070 TUSD).

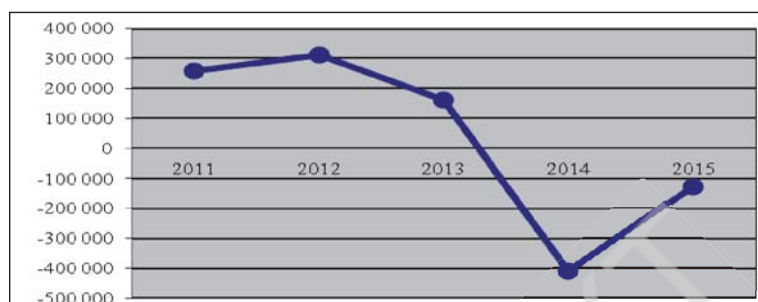


Fig. 2. Dynamics of changes in "Net profit / loss" of MHP S.A., TUSD

In 2011-2013 MHP S.A. received a net profit at the level of 160-310 million USD per year. In 2014 the company received a net loss of 412 million USD, in 2015 – 125 million USD. That was, first of all, connected to the significant hryvnia devaluation, as well as the ban on the poultry supply to the Customs Union, the termination of operation of the poultry farm "Shakhterskaya" in Donetsk region and enterprises in annexed Autonomous Republic of Crimea.

To calculate the weighted average cost of debt capital, it is necessary to determine the cost of long-term and short-term liabilities existing in the enterprise.

Long-term liabilities represent obligations with a maturity period of more than twelve months. Long-term liabilities include tax deferred liabilities and debt obligations of an organization. When assessing the financial status of an organization the existence of long-term liabilities is always taken into account. However, not always the presence of these obligations adversely affects the assessment, as they can be equated with own funds. Given inflation, the presence of long-term obligations can be considered as a positive thing.

Short-term liabilities are obligations that must be fulfilled within a year or the company's normal operating cycle, depending on which period is longer. These include: accounts payable, dividends payable, short-term bills, part of the long-term debt that must be paid in the current period.

Data on costs of long-term and short-term liabilities for 2014 are provided in Tables 2 and 3, respectively.

Table 2 – Cost of long-term liabilities of MHP S.A. in 2014

Indicators	Sum, TUSD	Cost, %
Bank loans	152 302	3.65
Issued bonds	724 522	8.25
Obligations under the lease	22 206	7.97
Deferral of tax liabilities	20 671	0
Total	919 701	7.30

The largest volume of long-term liabilities is on issued bonds. Their amount is 724 522 TUSD and the cost is 8.25%. The lowest volume is on deferral of tax liabilities – 20 671 TUSD. The average annual cost of MHP's long-term liabilities is 7.30%.

Table 3 – Cost of short-term liabilities of MHP S.A. in 2014

Indicators	Sum, TUSD	Cost, %
Trade payables	42 821	0
Other short-term liabilities	47 428	0
Bank loans	81 330	4.85
Issued bonds	218 738	10.25
Accrued interest	21 738	7.55
Obligations under the lease	16 393	7.97
Total	428 265	6.84

Among the short-term liabilities of MHP S.A. the most significant are the issued bonds (218 738 TUSD with a cost of 10.25%) and bank loans (81 330 TUSD with a cost of 4.85%). At the same time, the weighted average cost of short-term liabilities is 6.84%.

Data on costs of long-term and short-term liabilities of MHP S.A. for 2015 are provided in Tables 4 and 5, respectively.

Table 4 – Cost of long-term liabilities of MHP S.A. in 2015

Indicators	Sum, TUSD	Interest on loan, %
Bank loans	278 131	6.87
Issued bonds	728 530	8.25
Obligations under the lease	9 595	8.04
Deferral of tax liabilities	13 227	0
Total	1 029 483	7.77

In 2015 the largest volume of long-term liabilities falls on issued bonds and amounts to 728 530 TUSD with a cost of 8.25%. The lowest volume is on the obligations under the lease – 9 595 TUSD. The average annual cost of MHP's long-term liabilities is 7.77%.

Table 5 – Cost of short-term liabilities of MHP S.A. in 2015

Indicators	Sum, TUSD	Interest on loan, %
Trade payables	47 669	0
Other short-term liabilities	39 320	0
Bank loans	249 057	6.74
Issued bonds	-	0
Accrued interest	23 328	6.74
Obligations under the lease	14 027	7.97
Total	373 401	5.22

Among the short-term liabilities of MHP S.A. in 2015 the most significant are bank loans (249 057 TUSD with a cost of 6.74%) and trade payables (47 669 TUSD). At the same time, the weighted average cost of short-term liabilities is 5.22%.

Cost of MHP S.A. equity capital is calculated by using the CAPM method. Initial data for the calculation is presented in Table 6.

Table 6 – Initial data for the calculation of the capital cost of MHP S.A. and Kernel Holding S.A. [9-12]

Indicators	Values	
	2014	2015
R_f (risk-free rate)	2.125	2.412
β	0.66	0.63
Market bonus ($R_m - R_f$)	13.9	14.6
CRP (country bonus)	11.25	15.01

The calculation of the liabilities actual cost was carried out on the basis of data presented in the reports on the results of economic activities [13]. The results of calculating the weighted average cost of equity and debt capital for two years are presented in Table 7.

Table 7 – Weighted average cost of equity and debt capital of MHP S.A. in 2014-2015

Indicators	2014			2015			Absolute deviation of the structure
	Sum, TUSD	Specific weight, %	Weighted average capital cost	Sum, TUSD	Specific weight, %	Weighted average capital cost	
Equity capital	945 522	41	33.37	672849	32	42.65	
Long-term liabilities	919701	40	7.3	1029483	50	7.77	-9
Short-term liabilities	428265	19	6.84	373401	18	5.22	10
Total liabilities	1347966	59	7.15	1402884	68	7.09	-1
Total	2293488	100	17.14	2075733	100	17.6	9

MHP S.A. capital in 2015 decreased by 217 755 TUSD. The share of equity capital in 2015 decreased by 9%, while the sum of liabilities increased by 54 918 TUSD. This was due to the increase in long-term liabilities by 109 782 TUSD and the decrease in short-term liabilities by 54 864 TUSD.

The calculations show a large difference between the cost of equity (33% and 43%) and debt (7%). Due to this, the weighted average MHP S.A. cost was at the level of 17.14-17.6%. To determine the optimal capital structure, it is necessary referring to the credit rating depending on the debt load (Table 8 [9]).

Table 8 – Credit rating depending on the debt load

D/(D+E)	0	5	10	15	20	25	30	35	40	45
Raiting	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-
D/(D+E)	50	55	60	65	70	75	80	85	90	
Raiting	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	

The default spread depends on the credit rating (Table 9 [14]).

Table 9 – Default spread depending on the credit rating

Raiting	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-
default_spread	0.4	0.55	0.7	0.775	0.85	1	1.3	1.65	2	2.5
Raiting	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	
default_spread	3	4	4.75	5.5	6.5	7.25	8	9	9.8	

Based on the various indicators of the debt load and the return on equity and debt capital calculated for each of them, the WACC indicator can be determined (Tables 10 and 11).

Table 10 – Calculation of the WACC indicator for MHP S.A. in 2014

Wd	We	Raiting	default_spread	rd	re	D/E	WACC
0	100	AAA	0.4	2.950	22.55	0.00	22.55
5	95	AA+	0.55	3.100	22.94	0.05	21.92
10	90	AA	0.7	3.250	23.38	0.11	21.31
15	85	AA-	0.78	3.325	23.88	0.18	20.70
20	80	A+	0.85	3.400	24.43	0.25	20.10
25	75	A	1.00	3.550	25.06	0.33	19.52
30	70	A-	1.3	3.850	25.77	0.43	18.99
35	65	BBB+	1.65	4.200	26.60	0.54	18.50
40	60	BBB	2	4.550	27.56	0.67	18.03
45	55	BBB-	2.5	5.050	28.70	0.82	17.65
50	50	BB+	3	5.550	30.07	1.00	17.31
55	45	BB	4	6.550	31.74	1.22	17.24
59	41	BB-	4.6	7.150	33.37	1.44	17.14
60	40	BB-	4.75	7.300	33.83	1.50	17.12
65	35	B+	5.5	8.050	36.52	1.86	17.07
70	30	B	6.5	9.050	40.10	2.33	17.23
75	25	B-	7.25	9.800	45.12	3.00	17.31
80	20	CCC+	8	10.550	52.64	4.00	17.45
85	15	CCC	9	11.550	65.18	5.67	17.83
90	10	CCC-	9.8	12.350	90.25	9.00	18.14

According to calculations, WACC takes on a minimum value of 17.07 with a capital structure: 65% of equity and 35% of debt capital. It is this structure that should be considered as optimal one. The level of the debt load in 2014 was 59% and the WACC – 17.14. Thus, the capital structure of MHP S.A. in 2014 was close to optimal.

Table 11 – Calculation of the WACC indicator for MHP S.A. in 2015

Wd	We	Raiting	default_spread	rd	re	D/E	WACC
0	100	AAA	0.4	1.45	27.25	0	27.25
5	95	AA+	0.55	1.60	41.62	0.05	39.60
10	90	AA	0.7	1.75	42.47	0.11	38.36
15	85	AA-	0.78	1.83	27.95	0.18	23.98
20	80	A+	0.85	1.90	28.51	0.25	23.12
25	75	A	1.00	2.05	29.13	0.33	22.27
30	70	A-	1.3	2.35	29.85	0.43	21.47
35	65	BBB+	1.65	2.70	30.68	0.54	20.72
40	60	BBB	2	3.05	31.65	0.67	19.99
45	55	BBB-	2.5	3.55	32.79	0.82	19.35
50	50	BB+	3	4.05	34.16	1.00	18.74
55	45	BB	4	5.05	35.84	1.22	18.40
60	40	BB-	4.75	5.80	37.93	1.50	18.03
65	35	B+	5.5	6.55	40.63	1.86	17.71
68	32	B	6.3	7.35	42.65	2.13	17.75
70	30	B	6.5	7.55	44.22	2.33	17.60
75	25	B-	7.25	8.30	49.25	3.00	17.42
80	20	CCC+	8	9.05	56.79	4.00	17.29
85	15	CCC	9	10.05	69.36	5.67	17.41
90	10	CCC-	9.8	10.85	94.50	9.00	17.46

In 2015, according to calculations, optimal for MHP S.A. there was a capital structure with 80% of debt and 20% of equity capital (WACC 17.29). Since the actual level of the debt load was 68% (WACC 17.75), it is advisable for MHP S.A. to consider increasing the share of debt capital to achieve the optimal weighted average cost.

Determination of the optimal structure of the «Kernel» company

Kernel Holding S.A. ("Kernel") is the leading diversified agroindustrial company in the Black Sea region. Exporting annually about 7 million tons of agricultural products, "Kernel" is the largest supplier of sunflower oil and extraction cake to the international market, and one of the largest grain exporters from the Black Sea region.

Being an export-oriented company, "Kernel" operates a large assets base that is necessary for efficient and uninterrupted supply of agricultural products produced in Ukraine and Russia in excess of domestic

consumption. The company's assets include farm enterprises in the black-soils regions of Ukraine, oil extraction plants located in the sunflower growing zone, the largest private network of grain elevators throughout our country, port terminals on the Black Sea coast of Ukraine and Russia. The company's business model is based on leading positions in all key segments, on an experienced team of professionals and on competent risk management.

The company's activities are concentrated in the following business segments: sunflower oil production; export of sunflower oil and cereals; distribution of bottled oil in the domestic market; provision of services for transshipment of grain cargo in the port of Illichivsk and the ports of Nikolaev; storage of grain and oil seeds in internal elevators; agroproduction. The total number of employees exceeds 14 000 people. Vast majority of them work at agro-enterprises, oil extraction plants, grain elevators and port transshipment terminals.

The company produces products under the trademarks "Schedryiy Dar", "Stozhar", "Chumak Domashnyaya", "Chumak Zolota". The company accounts for about 8% of world production of sunflower oil. "Kernel" exports its products to more than 60 countries in the world. Among the main markets there are: India, EU countries, Egypt and Turkey. Kernel's facilities process 3 million tons of sunflower seeds per year, which allows obtaining 1.3 million tons of sunflower oil and about 1.2 million tons of sunflower extraction cake.

Kernel Holding S.A. is a joint-stock company registered in Luxembourg. Its securities are quoted on the Warsaw Stock Exchange.

"Kernel" key performance indicators for 5 years are presented in Table 12.

Table 12 – «Kernel» key performance indicators [15]

Year	Revenue from sales, TUSD	EBITD A, TUSD	Operating profit, TUSD	Net profit / loss, TUSD	ROE, %	ROA, %
2011	2 071,80	318 830	257 297	210 782	12.16	15.06
2012	2 796,80	287 560	200 891	105 253	8.49	12.15
2013	2 393,30	223 065	128 717	-107 406	6.71	11.62
2014	2 329,50	396 576	335 557	95 533	22.90	27.06
2015	1 988,50	346 374	287 190	226 844	19.03	22.95

The main results of activity in dynamics over 5 years are presented on the figures (Fig. 3 and Fig. 4).

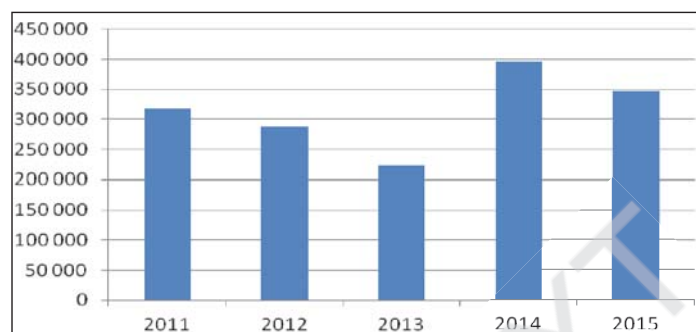


Fig. 3 Dynamics of changes in "EBITDA" of «Kernel», TUSD

In the period from 2011 to 2013 there is a downward trend in the "EBITDA" indicator, and in subsequent years the indicator is growing.



Fig. 4 Dynamics of changes in "Net profit / loss" of «Kernel», TUSD

The activity of Kernel is profitable – a net profit at the level of 95-226 million USD per year, except for 2013 when a net loss amounted to 107.4 million USD due to the unfavorable political situation in Ukraine, fall in commodity prices and hryvnia devaluation. In 2014-2015 the company managed to improve the situation and significantly improve its financial results.

To calculate the weighted average capital cost, it is necessary to determine the cost of equity and liabilities (long-term and short-term). The

calculation of the cost of long-term and short-term liabilities is presented in Tables 13,14,15 and 16.

Table 13 – Cost of long-term liabilities of «Kernel» in 2014

Indicators	Sum, TUSD	Interest on loan, %
Bank loans	88 901	7.21
Issued bonds	6 277	6.94
Obligations under the lease	1 879	0
Deferral of tax liabilities	19 613	0
Total	116 670	5.87

The largest share of the cost of long-term liabilities is bank loans, their amount is 88 901 TUSD and the cost is 7.21%. The lowest share is the obligations under the lease – 1 879 TUSD. The average annual cost of Kernel's long-term liabilities is 5.87%.

Table 14 – Cost of short-term liabilities of «Kernel» in 2014

Indicators	Sum, TUSD	Cost, %
Trade payables	27 384	0
Other short-term liabilities	63 380	0
Bank loans	298 005	6.81
Accrued interest	69 335	7.21
Total	458 104	5.52

The largest amount of short-term liabilities of "Kernel" are bank loans (298 005 TUSD with a cost of 6.81%) and accrued interest (69 335 TUSD with a cost of 7.21%). At the same time, the weighted average cost of short-term liabilities is 5.52%.

Table 15 – Cost of long-term liabilities of «Kernel» in 2015

Indicators	Sum, TUSD	Cost, %
Bank loans	81 841	7.30
Issued bonds	2 275	10.55
Obligations under the lease	37 736	0
Deferral of tax liabilities	17 143	0
Total	138 995	4.47

The largest volume of long-term liabilities falls on bank loans. Their amount is 81 841 TUSD with a cost of 7.30%. The lowest volume is on the issued bonds – 2 275 TUSD. The average annual cost of Kernel's long-term liabilities is 4.47%.

Table 16 – Cost of short-term liabilities of «Kernel» in 2015

Indicators	Sum, TUSD	Cost, %
Trade payables	41 910	0
Other short-term liabilities	179 615	6.55
Bank loans	76 945	0.00
Accrued interest	74 835	7.30
Total	373 305	4.61

Among the short-term liabilities of "Kernel" the largest share is made up of other short-term liabilities (179 615 TUSD with a cost of 6.55%) and bank loans (81 330 TUSD). At the same time, the weighted average cost of short-term liabilities is 4.61%. Kernel's equity capital cost is calculated using the CAPM method based on the initial data of Table 9.

Table 17 – Weighted average cost of equity and debt capital of «Kernel» in 2014-2015

Indicators	2014			2015			Absolute deviation of the structure
	Sum, TUSD	Specific weight, %	Weighted average capital cost	Sum, TUSD	Specific weight, %	Weighted average capital cost	
Equity capital	890 844	61	27.4	997 055	66	30.5	5
Long-term liabilities	116 670	8	4.36	138 995	9	4.47	1
Short-term liabilities	458 104	31	5.52	373 305	25	4.61	-6
Total liabilities	574 774	39	5.28	512 300	34	4.57	-5
Total	1 465 618	100	18.41	1 509 355	100	21.4	0

In 2015 the total capital of "Kernel" increased by 43 737 TUSD, which was due to an increase in the amount of equity by 106 211 TUSD and a decrease in the amount of debt funds by 62 474 TUSD. At the same time short-term liabilities increased by 84 799 TUSD (by 6%) and long-term – by 22 325 TUSD (by 1%). More expensive equity capital (27% in 2014 and 30% in 2015) is offset by a cheap debt capital (5% and 4.5%). That is why the weighted average capital cost of "Kernel" in 2014-2015 was at the level of 18-20%.

Table 18 – Calculation of the WACC indicator for «Kernel» in 2014

Wd	We	Raiting	default_spread	Rd	Re	D/E	WACC
10	90	AA	0.7	4.080	23.38	0.11	21.38
15	85	AA-	0.7750	4.155	23.88	0.18	20.81
20	80	A+	0.85	4.230	24.43	0.25	20.24
25	75	A	1.00	4.380	25.06	0.33	19.69
30	70	A-	1.3	4.680	25.77	0.43	19.19
35	65	BBB+	1.5	4.880	26.60	0.54	18.69
39	61	BBB+	1.9	5.280	27.36	0.64	18.38
40	60	BBB	2	5.380	27.56	0.67	18.30
45	55	BBB-	2.5	5.880	28.70	0.82	17.96
50	50	BB+	3	6.380	30.07	1.00	17.65
55	45	BB	4	7.380	31.74	1.22	17.61
60	40	BB-	4.750	8.130	33.83	1.50	17.53
65	35	B+	5.5	8.880	36.52	1.86	17.51
70	30	B	6.5	9.880	40.10	2.33	17.70
75	25	B-	7.25	10.630	45.12	3.00	17.82
80	20	CCC+	8	11.380	52.64	4.00	17.99
85	15	CCC	9	12.380	65.18	5.67	18.41
90	10	CCC-	9.8	13.180	90.25	9.00	18.75

In 2014 the capital structure was optimal at a ratio of 65% of debt capital and 35% of equity capital, since the minimum WACC (17.51%) was observed. In fact, in 2014 Kernel had 39% of debt capital and WACC 18.38%, i.e. the capital structure was not optimal.

Table 19 – Calculation of the WACC indicator for «Kernel» in 2015

Wd	We	Raiting	default_spread	Rd	Re	D/E	WACC
10	90	AA	0.7	3.690	27.46	0.11	25.01
15	85	AA-	0.7750	3.765	27.95	0.18	24.22
20	80	A+	0.85	3.840	28.51	0.25	23.43
25	75	A	1.00	3.990	29.13	0.33	22.67
30	70	A-	1.3	4.290	29.85	0.43	21.95
34	66	BBB+	1.58	4.570	30.51	0.54	21.41
35	65	BBB+	1.65	4.640	30.68	0.64	21.27
40	60	BBB	2	4.990	31.65	0.67	20.63
45	55	BBB-	2,5	5.490	32.79	0.82	20.06
50	50	BB+	3	5.990	34.16	1.00	19.54
55	45	BB	4	6.990	35.84	1.22	19.28
60	40	BB-	4,750	7.740	37.93	1.50	18.98
65	35	B+	5,5	8.490	40.63	1.86	18.74
70	30	B	6.5	9.490	44.22	2.33	18.71
75	25	B-	7.25	10.240	49.25	3.00	18.61
80	20	CCC+	8	10.990	56.79	4.00	18.57
85	15	CCC	9	11.990	69.36	5.67	18.76
90	10	CCC-	9.8	12.790	94.50	9.00	18.89

In 2015 the minimum WACC (18.57%) was observed with a debt capital share – 80%. Since the actual level of the debt load is 34% and WACC is 21.41, the company can raise additional debt capital which will positively affect the total capital cost.

Conclusions

The capital of agricultural holdings of Ukraine is formed under the influence of disproportion – the high equity capital cost and low debt capital cost on the European stock markets. The high cost of equity is due to the low credit rating of Ukraine and the high risk of entrepreneurial activity in our country.

In general the capital structure of both MHP S.A. and "Kernel" is not optimal, but tends to it. Management of companies can increase the share of debt capital, since its cost is cheaper than the cost of equity. But it should be borne in mind that due to increased liabilities, the risk of insol-

vency increases, and this in turn can lead to bankruptcy of companies. Hence, the possible consequences of the debt capital share increase should be taken into account. Consequently, the decision of the company's managers must be verified and weighed.

References

1. Diduh S.M. Ocinka finansovogo stanu ta dy`namiky` rozvy`tku agroxyldy`ngiv Ukrayiny` / S.M. Didux // *Ekonomika xarchovoyi promy`slovosti*. – 2015. – S. 41–49.
2. Modigliani F. The Cost of Capital, Corporation Finance and the Theory of Investment / F. Modigliani, M. H. Miller. // *Amer. Econ. Rev.* – 1958. – C. 261–297.
3. Williams J. The Theory of Investment Value / J. Williams. – Cambridge: MA: Harvard University Press, 1938. – 638 c.
4. Vorontsov D. A. Otsenka optimalnoy struktury kapitala kompaniy MD MEDICAL GROUP i X5 RETAIL GROUP / D. A. Vorontsov, N. A. Zubkov. // *Korporativnyie finansyi*. – 2014. – №1(29) – S. 99–107.
5. Ivashkovska I. V. Struktura kapitala: rezervyi sozdaniya stoimosti dlya sobstvennikov kompanii / I. V. 5. Ivashkovska, A. S. Kupriyanov. // *Upravlenie kompaniey..* – 2005. – №2. – S. 1–5.
6. Opredelenie optimalnoy struktury kapitala rossiyskih kompaniy na primere OAO «Magnit» i OAO «Lukoil» / [M. M. Kalimulin, N. A. Menshova, I. M. Usok ta In.]. // *Korporativnyie finansyi*. – 2014. – №2. – C. 59–76.
7. Teplova T. V. Investitsii / T. V. Teplova. – Moskva: Yurayt, 2011. – 724 c.
8. U.S. 7-Year Bond Yield [Electronic resource]. – 2017. – Access mode: <https://www.investing.com/rates-bonds/u.s.-7-year-bond-yield>.
9. The Sovereign Spread of Ukraine [Electronic resource] – Access mode: <http://pages.stern.nyu.edu/~adamodar/>.
10. The Trading Economics credit rating [Electronic resource] – Access mode: <http://www.tradingeconomics.com/country-list/rating>.
11. Koefitsiyent chutly`vosti do ry`zy`kiv [Electronic resource] – Access mode: <http://pages.stern.nyu.edu/~adamodar/>.
12. The market premium for the US market. [Electronic resource] – Access mode: <http://corporate.morningstar.com/ib/documents/targetmaturity/Ibbotson-Target-Risk-Report-Q1-2014.pdf>.

13. Konsolidovany`j zvit menedzhmentu Rady` Dy`rektoriv MHP S.A. za 2015 r. [Electronic resource] – Access mode: http://www.mhp.com.ua/library/file/mhp-sa-fs-2015-ukr-final_1.pdf.

14. Spread of default based on the credit rating [Electronic resource] – Access mode: <http://www.pages.stern.nyu.edu/~adamodar/>.

15. Kernel Holding S.A. Annual Report and Accounts 30 June 2016 [Electronic resource] – Access mode: http://www.kernel.ua/media/uploads/library/16/12/KERNEL_FY2016_Annual_Report_2.pdf.

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